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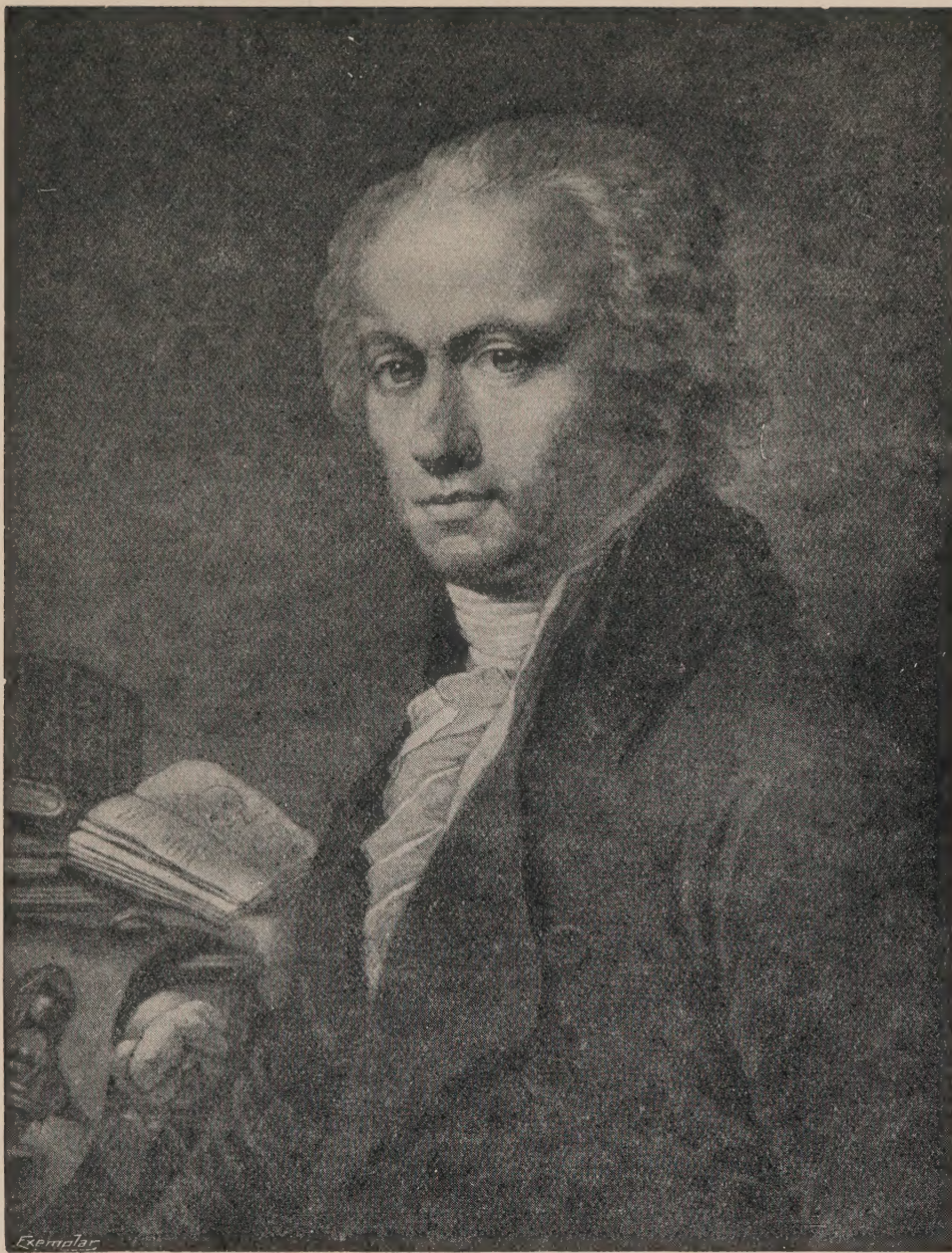
IN COMMEMORATION
OF
FRANCIS JOSEPH GALL
(1758-1828).

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A brief account of his life and achievements
on the hundredth anniversary of his death.

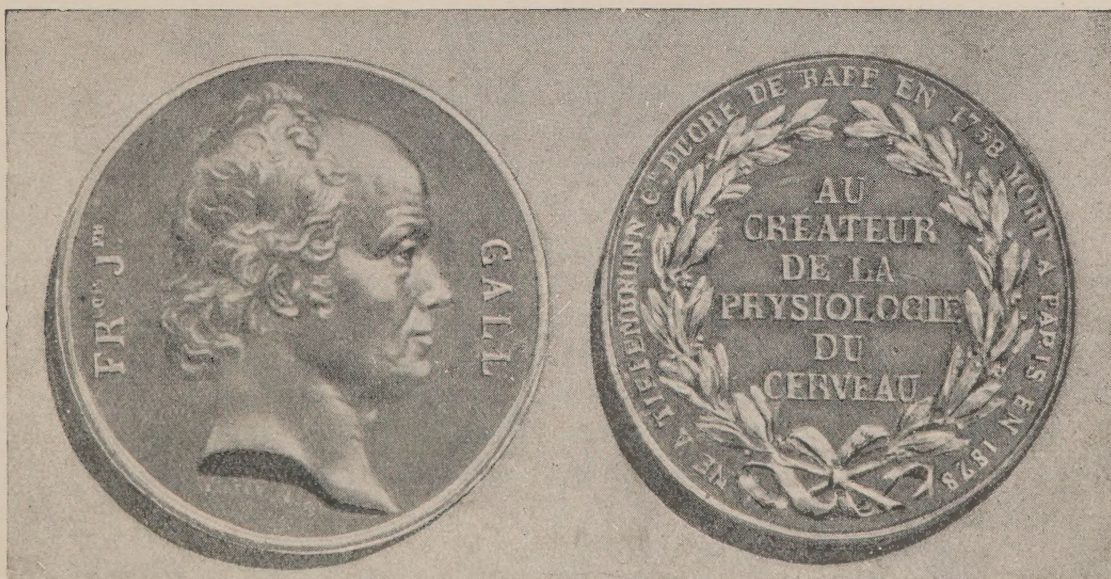
By
BERNARD HOLLANDER, M.D.

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DR. FRANCIS JOSEPH GALL.
Born 9th March, 1758, died 22nd August, 1828.



REPLICA OF GOLD MEDAL IN MEMORY OF GALL.
"The profound observer whose genius has opened for us the study of the anatomy and physiology of the brain."—*Flourens*.



GALL'S PUBLICATIONS.

Philosophisch-medizinische Untersuchungen über Natur und Kunst im gesunden und kranken Zustande des Menschen. Wien, 1792.
Only Part I. of this medico-philosophical work was published.

Brief des Dr. F. J. Gall an Baron J. F. de Retzer über die Funktionen des Gehirns in Menschen und Tieren. Wien, 1798.

Introduction au cours de Physiologie de Cerveau. Paris, 1808.

Recherches sur le Système Nerveux en général et sur celui du Cerveau en particulier. Mémoire présenté à l'Institut de France le 14 Mars, 1804. Paris, 1809.

Anatomie et Physiologie du Systeme Nerveux en général et du Cerveau en particulier. Paris, 1810-1819. Four volumes in quarto and a large folio Atlas with 100 engraved plates.

Sur les Fonctions du Cerveau. Paris, 1822. An octavo edition of his big work in six volumes with numerous additions, including replies to his critics. The quotations made by me are from this work.

Articles on "Cerveau" and "Crâne" in the Dictionnaire des Sciences Médicales.

IN COMMEMORATION OF FRANCIS JOSEPH GALL.

1758—1828.

A brief account of his life and achievements on the hundredth
anniversary of his death.¹

By BERNARD HOLLANDER, M.D.

SEEING recent acknowledgments of Gall's genius as an anatomist and physiologist (Sir Henry Head's Hughlings Jackson Lecture, 1920, and Prof. G. Elliot Smith's Henderson Trust Lecture, 1923), and the year 1928 being the hundredth anniversary of his death, a brief recapitulation of his achievements, which are still insufficiently known and appreciated, may be of interest and serve as a small tribute to a man who devoted his whole life disinterestedly to brain research and the study of mind and character in man and animals.

Few pioneers have been so persistently misrepresented by men who had not even looked at his writings. However, as Prof. G. Elliot Smith said: "The time has arrived for a juster appreciation of the important part played by Gall, and a more adequate recognition of his achievements than has been made in the past. If he was responsible for certain speculations which in the hands of irresponsible followers have been used for meretricious purposes, it must not be forgotten that Gall's work brought to an end a barren system of philosophy which seriously impeded progress. His contributions to the anatomy of the central nervous system are of far reaching importance, and to the physiology of the brain and to psychological theory he gave a new orientation and a new inspiration."

1. *Gall as Brain Anatomist and Physiologist.*

Gall was the first to describe the successive development of the brain and nervous system from the lowest animal to man, and the simplicity of the convolutions in the newly born and in the feeble-minded, as compared with the complexity of the cerebral organisation in the normal adult. He dissected the brain from below upwards, tracing the nerve fibres from the spinal cord to the basal ganglia of the brain and thence to the surface. He was the first to unfold the convolutions and to demonstrate the fibrous structure of the white matter of the brain; and he is the discoverer of the true origin of several of the cranial nerves; the olfactory, optic, oculomotorius, trigeminal and abducens nerves.²

¹ A resumé of this essay appeared in the *Medical Press*" (London), of July 4th, and in *Medical Life* (New York), of August, 1928.

² For full details see books mentioned page 15.

The famous anatomist Reil (1759—1813) acknowledged: “I have seen more in the anatomical demonstrations of the brain by Gall than I conceived a man could discover in the course of a long life.”

Another contemporary, Jean Pierre Flourens (1794—1867), a most formidable opponent of Gall, wrote of him as being: “The profound observer whose genius has opened for us the study of the anatomy and physiology of the brain. One can estimate his work only at its true value if one is acquainted with the depth of ignorance which prevailed when he appeared. I shall never forget the impression I received the first time I saw Gall dissect a brain. It seemed to me as if I had never seen that organ.”

Geoffroy St. Hilaire (1772—1844) said: “I shall always remember our astonishment and our enthusiasm on seeing Gall for the first time demonstrate his anatomical discoveries. The word ‘brain’ will always call up to mind the name of Gall.”

At a time when the organ of the mind was sought in the ventricles of the brain, and it was believed that there is a “common centre” (*sensorium commune*) in the brain where all the sensations are brought to a point*, Gall recognised that the cortex, *i.e.*, the grey surface of the brain, was the material basis of all mental and moral activity, the instrument through which all psychical manifestations took place.

He showed that “as the cortex of the brain becomes more and more developed in animals and man, so does the mental manifestation increase.” In other words, that “the evolution of the mental powers proceeds parallel with the evolution of the brain.”

At the same time he realised that “the brain depends upon the other organs of the body for its health, and even for its life,” and that “a sound, well-developed, well-proportioned, well-nourished brain is necessary to a well-balanced intellect and a moral character.”

He held that “the fundamental qualities of the mind, whether intellectual capacities, emotional dispositions or animal propensities, are located in more or less circumscribed parts of the cortex of the brain.”

“We know that functions of different kinds are localised in different parts of the cortex.” (D. J. Cunningham, Professor of Anatomy in Edinburgh University, British Association Meeting, 1901).

“Other things being equal, there are grounds for believing that a high development of certain regions of the

* The great German anatomist Sömmering (1755—1830), in opposition to Gall’s discovery of the ascending sensory and descending motor nerve fibres from the cortex of the brain—the two sets being always found together—declared that all the motor and sensory nerve-fibres take their origin in the walls of the ventricles and that they are united by no other material than the cerebro-spinal fluid, which must be regarded as the seat of the soul. His friend, the philosopher Kant, had to point out to him that the soul could not possibly reside in a fluid.

brain will be found associated with special faculties of which the regions in question are the essential basis." (Ferrier, *Functions of the Brain*).

Much of the opposition to Gall's doctrine in its early days was due to the belief that the surface of the brain was structurally uniform; but we all know now that there are at least twenty-seven anatomically distinct areas in the cortex, which being different in design must be assumed to have different functions.

"Throughout the mammalian series (including man) there occurs in definite localities of the cortex the same characteristic structural formation, so that we can define homologous areas in the different animals, varying only in extent. The cortex contains, therefore, a multiplicity of organs, differentiated structural complexes, which we are led to assume from the analogy of other organs to have separate functions; so that the work hitherto performed in the lower animals by the whole brain is now split up and localised, the more precisely the higher the animal is in creation." (K. Brodman, *Vergleichende Lokalisationslehre der Gehirnrinde*, 1909.)

This was also confirmed by Prof. G. Elliot Smith in his Henderson Trust Lecture. He said: "We now know for certain that there is a very definite and precise anatomical localisation, *i.e.*, the cortex is divided up into a number of territories differing in structure from neighbouring territories, and presenting contrasts in appearance of so marked a type that the boundary line between these territories can be mapped out." And Sir Arthur Keith said: "All that we know assures us that the various kinds of work carried on by the brain are localised in different parts of its cortex."

Gall held that "other things be equal, the greatest amount of mental capacity and vigour is allied with the largest quantum of cerebral substance."

He explained that "mere size indicates power only, but does not indicate its direction, whether in intellect, emotional feeling, or animal passion. A man, like an animal, may have a large mass of brain, and yet not manifest much intelligence, but both will exhibit power of some sort or other." But, of course, "In calculating the power of an organ, quality and internal activity as well as size must be attended to."

"When we see an area on the cerebrum rise up in the form of an eminence, we may reasonably conclude that the growth in the area concerned is the structural foundation of a centre of functional activity of an acute kind." (Prof. D. J. Cunningham, British Association Meeting, 1901).

Mathias Duval, who made the post mortem of Gambetta's brain, wrote: "What person has ever been a greater orator and improviser of speeches? In him the third left frontal convolution was enormously developed." (*L'Aphasie depuis Broca*, 1888).

Prof. G. Elliot Smith: "The brains of the primitive members of the human family; as well as of representatives of the existing races, reveal the fact that profound differences do occur between human brains, and that they are due in the

main to the localised hypertrophy or the localised atrophy of definite regions rather than of the brain as a whole."

At a time when the cortex of the brain was believed to be uniform in structure and function, Gall noticed the differences between animal and human brains, and between the brains of the various types of animals, and concluded that these differences must correspond to differences in mental functions. In his own words: "One species of animals is endowed with mental powers, in which another is deficient, a fact that would be inexplicable, did not each particular cerebral function reside in a particular portion of the brain. When nature repeats an apparatus, she repeats also the function, and when she has for an object functions essentially distinct, she creates also essentially distinct apparatus."

The fact that injury to the head, and localised lesions in general, not infrequently affect one or more of the mental qualities, while others remain perfectly sound, was to Gall another proof of different parts of the brain having different functions.

Whereas mind was and still is to this day regarded by many physiologists as identical with intellect, Gall recognised that the emotions and instinctive propensities are also part of the mind, and the more important in animals. Noticing too, that we have certain parts of the brain in common with animal brains, and some which in size and complexity are distinctly human, he came to the conclusion that the frontal lobes contain the centres for the highest intellectual processes, and that therefore a large brain does not necessarily indicate superior intelligence, and a small head may shine in intellect if the greater portion of the brain is in the frontal lobes.

Prof. G. Elliot Smith (*British Medical Journal*, 1923), has shown that the development of the brain from the lowest stages to that of modern man was chiefly in this region.

Sir Charles Sherrington, F.R.S. (*Lectures on Physiology for Teachers*, 1901), acknowledged that: "The higher intellectual operations take place in the frontal lobes. Consequently, the brain may be wide or narrow, deep or flattened, the size and shape of the *entire* mass can be no measure of the intellectual endowment."

J. S. Bolton (*Brain in Health and Disease*, 1914), said: "The prefrontal region is the region of the cerebrum which is concerned with the performance of the highest co-ordinating and associational processes of mind. It is of extremely complex structure and of finer architecture than any other part of the brain. It is the last region of the cortex cerebri to develop, and is the first to undergo retrogression."

Prof. L. Bianchi, in his book on *The Mechanism of the Brain and the Functions of the Frontal Lobes* (1922), said: "The destruction of the frontal lobes entails the loss of the anatomical and physiological basis upon which judgment and the reasoning faculties are reared."

B. Sachs, the well-known American neurologist, found that "A defective development of the frontal lobes leads to complete idiocy, even though the remainder of the hemispheres has attained to normal growth."

Gall regarded the frontal lobes as the region for the higher intellectual operations, as well as an inhibitory apparatus against

the lower and more instinctive natural impulses and the purely vegetative functions. That is the reason, as I have shown*, why injury of this region so often affects the moral character.

Gall discovered specific abilities to be connected with certain areas of the frontal lobes, definite inborn talents, as for arithmetic, construction (manual dexterity), poetry, music, and so forth—some of them no doubt complex faculties—and I have published a large number of cases, in which these capacities got lost after circumscribed injury or disease of these brain centres. Yet to the best of my knowledge there is no brain expert who has ever looked for such centres or even admitted the possibility of such a localisation. Here is a splendid opportunity for the research scholar.

Gall held that there is no universal faculty of memory that can be localised in the brain, but that each mental power has its own memory.

It is now admitted that Gall—and not Broca, sixty years later—was the first to locate the centre for articulate speech and verbal memory at the basal extremity of the third frontal convolution, bordering on the island of Reil, and he and his followers published numerous cases of aphasia. “The description of these cases,” said Sir Samuel Wilks (*Guy’s Hospital Reports*, 1879), “is most excellent, and the aphasic condition seems so perfectly understood, that it is really surprising why all that is known about it nowadays should not have been taught equally well fifty years ago.”

The Instinctive Tendencies have also received more or less confirmation by various authorities. Thus the Alimentary Instinct at the anterior extremity of the Temporal Lobes has been confirmed by Sir David Ferrier (*op. cit.*) and Stephen Paget (*Transactions of the Clinical Society of London*, 1897). There are hundreds of cases on record† of lesions of the temporal lobes, which were followed by aggressiveness and violent mania; hundreds of cases of lesions of the parietal lobes with anxiety psychoses and melancholia, and so forth.

Considering the statement frequently made that portions of the brain may be lost by injury or disease without any mental change following, it is no wonder that the evidence which Gall and his successors have published is still disregarded. But if it be true that the brain can be destroyed to a considerable extent without affecting either mind or character, one may well ask of what use is the brain?

Gall had a much clearer insight into the mental functions, for, in his view, the intellect and the instinctive dispositions and emotions are related to different parts of the brain, and this explains why so often the conduct becomes altered in lesions of the brain while the intellect remains unaffected.

Gall’s localisations have been misunderstood, and are still misunderstood, because of his peculiar terminology, and no critic has ever taken the trouble to read his work to ascertain his meaning. What his critics also neglect to state is that Gall tried to confirm his localisations, whenever possible, by post-mortem investigations. Contrary to common belief, he originated no system,

* See the books mentioned on page 15.

† Quoted in my books.

but simply recorded his observations. Indeed, he warned his readers "to accept nothing without proof and re-examination." All his localisations he marked on the brain as well as on the skull, as may be seen by anyone looking at the illustrations of his big work, and though he circumscribed the centres in his diagrams for better understanding, he admitted that each centre merges into the neighbouring ones. It must also be noted that he had limited himself to the observations of extremes of cerebral and mental development; for, as he said, "average heads indicate average ability and disposition, and cannot be cited as proofs or disproofs of my doctrine."

Gall held that "the size and shape of the skull gives a fair indication of the size and shape of the brain," a principle now acknowledged by every anatomist, but long denied, though Gall himself called attention to the difficulties in estimating the size of certain parts of the brain owing to the varying thickness of the skull, the frontal sinus, etc.

In Gall's time, in fact until about thirty years ago, it was taught in all the medical schools, that the skull grows independently of the brain (Prof. Hyrtl) and "that from the size and shape of the head no conclusion whatever could be made as to the extent of surface of the brain." (Prof. Allen Starr, "*Popular Science Monthly*," 1889). Prof. Leonard Hill (*Manual of Physiology*, 1899), called it "quackery and deceit" to determine the size and shape of the brain by the size and shape of the skull. Gotch, Professor of Physiology in the University of Liverpool, held that "it would be just as possible for a safe-maker to examine the knob or handle of a safe, and then profess to be able to tell what amount of wealth was contained in the safe in its various drawers and compartments." Another distinguished professor said: "It is just as reasonable to determine a person's digestive capacity by looking at his waistcoat, as it is to pretend to know the shape of the brain by looking at the skull." It would have been easy to verify this; but there are none so blind as those who do not want to see.

All these opinions are now reversed.

Prof. D. J. Cunningham (*British Association Meeting*, 1901), declared that "The Cranial vault fits like a tight glove on the surface of the enclosed cerebrum."

Johnson Symington, Professor of Anatomy in Belfast University (*British Association Meeting*, 1903), said: "It is the brain growth that determines the form of the cranium, and not the skull that moulds the brain into shape. There can be no doubt that within certain limits the external form of the cranium serves as a reliable guide to the shape of the brain. Indeed, various observers have drawn attention to the fact that in certain regions the outer surface of the skull possesses elevations and depressions which closely correspond to definite fissures and convolutions of the brain."

Prof. G. Elliot Smith: "It is the growth of the brain which determines the size and form of the skull, and not *vice versa*. The brain and the skull grow and expand together; the developing brain as a whole, and also each of its individual

departments, have the power to enlarge and modify the containing walls of bone, according to needs. The size and form of the skull do depend on the form and size of the brain."

II. *Gall as a Psychologist.*

Gall did not study "mind"; he studied mental processes. He was opposed to regarding mind as an entity and unity. He knew only a mental organisation. He started out on an original course of investigation of mental activities, which included amongst other subjects: Animal Psychology, Infant Psychology, Social and Race Psychology, Normal and Abnormal Psychology.

According to Gall, mind cannot be comprehended without a study of its development and a comparison of animal and human dispositions. All the psychological elements of the animal kingdom are present in man*. The dividing line between man and animals is not drawn between instinct and reason. Brutes also reason, and man is not without his animal instincts. Even what we consider specifically human in the mind exists in its rudiments in the animal.

He observed and analysed the intellect and the motive powers of human behaviour, not the entities created by introspective meditation. To him, "the external world is known only to the extent of our perception of it, which varies according to our own individuality." Further, he said: "The eye does not see, nor the ear hear. Behind ear and eye there is something which changes all that is supplied by the senses into percepts and concepts."

Gall explained that the emotions and instinctive dispositions are manifested previous to experience while the intellectual abilities require to be drawn out and trained. As regards moral liberty, he said: "Education can teach us to control our dispositions but cannot eradicate them. The influence of education, instruction, example, and of surrounding circumstances, acts principally when the innate dispositions are neither too feeble nor too energetic. The more complex the organisation the greater the choice, the greater the freedom. Animals do not enjoy perfect liberty, yet they act without any restraint. Man possesses, besides animal qualities, the faculty of speech and unlimited educability—two inexhaustible sources of knowledge and action. He distinguishes the truth from error, right from wrong; he has the consciousness of freewill; the past and future are able to influence his actions. Thus armed, man may combat his inclinations that lead him into temptation. It is the struggle against the propensities which gives rise to virtue, vice, and moral responsibility."

Gall did not personify the faculties. He observed and analysed the intellect and motive powers of human behaviour, not the entities created by introspective meditation. In fact, he strenuously opposed the "faculty" psychology, which was so popular in his day. The faculties, he declared, were simply different directions of the activity of the mind. "We have to

* This was at a time when distinguished physiologists, like Rudolphi (1771—1832), declared "beasts should not be compared with men."

discover the fundamental powers of the mind, for it is only these that can have separate centres in the brain."

Three great philosophers were inspired by Gall's doctrine. First, Auguste Comte (1798—1857), a member of the Paris Phrenological Society, who frankly acknowledged the greatness of Gall, and with slight modifications adopted his teachings in his great work on *Positive Philosophy*. The second was Herbert Spencer, who was an ardent phrenologist in his young days and published several essays on the subject in the *Zoist*, Vol. I. and II. These articles had been previously rejected by George Combe, when offered to the *Edinburgh Phrenological Journal*, which so incensed Spencer, that he made use of the subject in his *Principles of Psychology* (1855), without acknowledgment.¹ The third is the distinguished Professor of Philosophy, William MacDougall, who achieved phenomenal success with his *Social Psychology*, which has gone through twenty editions, and which I have shown (in a pamphlet published by me in parallel columns), to be identical almost word for word with Gall's own writings.²

The division of the intellectual processes was always known and need not be here referred to; but it was Gall, and not (as stated by William MacDougall in his *Social Psychology*) Darwin, in the *Descent of Man*, who first enunciated the true doctrine of human motives, and showed how we must proceed, relying chiefly upon the comparative and natural history method if we would arrive at a fuller understanding of them.³

Gall realised over a century before MacDougall that "the department of psychology that is of primary importance is that which deals with the springs of human action, the impulses and motives that sustain mental and bodily activity and regulate conduct," and that "the basis required is a comparative and physiological psychology relying largely on objective methods, the observation of the behaviour of men and animals of all varieties under all possible conditions of health and disease."

MacDougall merely repeats what Gall said, that: "The mental constitution of man differs from that of the highest animals chiefly in that man has an infinitely greater power of learning, of profiting by experience, of acquiring new modes of reaction and adjustment to an immense variety of situations. The superiority of man would seem to be due in the main to his possession of a very large brain, containing a mass of plastic nerve tissues which exceeds in bulk the sum of the innately organised parts and makes up the principal part of the substance of the cerebral hemispheres." And he again repeats Gall: "The evidence that the main basis of

¹ As I have shown in an article, "Herbert Spencer as a Phrenologist," which appeared in the *Westminster Review*, February 1893, and was acknowledged by him in his *Autobiography*.

² Reprint from *Ethological Journal*, October 1924. Prof. MacDougall, to whom a copy of the pamphlet was submitted by Dr. John T. Miller, of Los Angeles, acknowledged that "The parallel drawn between Gall's views and what I have written is certainly very striking."

³ Darwin, who gets the credit of having been the first to give us an account of the development of the human mind, had simply adopted the phrenological description on the advice of, and as acknowledged by, Sir James Crichton-Browne, who like his distinguished father was, at least in those days, a strong believer in Gall's doctrine.

the human mind, constituted by the sum of innate tendencies, has a stable unchanging character is afforded by comparative psychology. For we find, not only that these tendencies, in stronger and weaker degrees, are present in men of all races now living on the earth, but that we may find all of them, or at least the germs of them, in most of the higher animals."

Misled by the crude terminology, the classification of the mental powers by Gall and his successors has been held up to ridicule by our learned scientists and philosophers for more than a century. Yet MacDougall in his book on *Social Psychology* has boldly adopted it. There is the Instinct of Pugnacity and the Emotion of Anger, leading to Aggressiveness and overcoming of Resistance; the Emotion of Fear, which combined with intellectual activity gives Circumspection and Foresight, and leads either to Flight, Concealment or Cunning; the Impulse to Collect and Hoard; the Sex Instinct; the Love of Offspring; the Social, Gregarious, or Herd Instinct; the Instinct of Self-Assertion (and Self-Abasement), which leads to boasting, swaggering, vanity, and, if too weak, gives rise to the Inferiority Complex; the faculties of Imitation, Sympathy, Wonder, and the Religious Emotion.

Essays on the Aggressive Instinct, Constructiveness, Acquisitiveness, Anger, Fear, the Gregarious Instinct, etc., have appeared, and are constantly appearing, in Psychological Journals, and are published apparently in ignorance of the numerous essays on the same subjects which were written by the early phrenologists in the first half of last century, and appeared in the Transactions of the various Phrenological Societies and the *Edinburgh Phrenological Journal*.

III. Gall's Biography.

Francis Joseph Gall was born on March 9th, 1758, in the village of Tiefenbrunn, in the Duchy of Baden in Germany. He went to study medicine in Vienna, and after obtaining his degree in 1785, he there carried on investigations into the structure and functions of the brain and nervous system for a long series of years. In 1796 he made the first announcement of his discoveries and started giving public lectures, which, in 1802 were prohibited by the Austrian Government, spurned on by the Roman Catholic Clergy, on account of their supposed materialistic tendency. Gall thereupon left Vienna and went on a tour, visiting German and other Continental Universities, everywhere giving demonstrations of brain dissections.

Hufeland (1762—1836), physician to the King of Prussia, wrote of him at the time: "I am fully convinced that he ought to be regarded as one of the most remarkable phenomena of the eighteenth century, and that his doctrine should be considered as forming one of the boldest and most important steps in the study of the kingdom of nature."

Gall finally settled in Paris in 1807. He presented a memoir of his discoveries to the Institute of France, but it was not until 1822 that Flourens (1794—1867), professor of physiology, was commissioned to make an experimental investigation into the functions of the brain. Now Flourens was an out-and-out believer in one indivisible intelligence, the unity of the ego, and with this preconception found the brain a unity too. He proved

to the satisfaction of his age that there were no subdivisions in the brain for the different activities; and his opinion, as is well known, dominated the medical world for fifty years, *i.e.*, until the discovery of motor and sensory centres by Hitzig, Fritsch, Ferrier, and other experimental physiologists.*

Notwithstanding Flourens' adverse report, Gall had a large following of distinguished medical men and other professors in the Universities of France. There was Adelon, Andral, Bouillaud, Brierre de Boismont, Broussais, Cloquet, Auguste Comte, Falret,

* Sir David Ferrier, it is not generally known, was really Lecturer on Toxicology in King's College, London, (1872—1889), and was invited by his friend (Sir James) Crichton-Browne, then an ardent phrenologist, to come to his institution at Wakefield and repeat Hitzig's experiments on the exposed brains of living animals to confirm phrenology. The first results, which were published in the West Riding Lunatic Asylum Medical Reports, Vol. III., 1873, were indeed of phrenological significance.

Ferrier found motor centres all over the brain, except in the pre-frontal lobes, which he regarded as subserving the intellectual processes. Subsequently, Sir Victor Horsley and Beevor (1885) restricted the motor area to the two central convolutions: the ascending frontal and parietal. Later, Sir Charles Sherrington and Otto Grünbaum (1901) restricted the motor area still further, to the ascending frontal convolution alone. They declared no movement whatever could be obtained from excitation of the ascending parietal convolution. Finally, Horsley himself (*British Medical Journal*, 1909) cast doubt on the remaining motor area, for "the movements return after complete destruction of the motor area" and must therefore originate in other and deeper parts of the brain.

Seeing that experimental research resulted only in the localisation of sensory and motor centres in the brain, many physiologists were more than ever convinced that localisation of mental functions, as claimed to have been discovered by Gall, cannot exist; but they might as well have denied not merely the localisation of mental functions but the existence of mind itself, because we cannot separate with our scalpels that ethereal essence from our grosser parts, and subject it to an examination by one or all of our external senses. When we examine with the most scrupulous minuteness the form, colour, and texture of the brain, no sentiment can be perceived slumbering in its fibres, nor half-formed ideas starting from its folds. It appears to the eye only as a mass of curiously convoluted matter, or under the microscope as an aggregate of differently shaped cells; and the understanding declares its incapacity to penetrate the purpose of its parts. In fact, we cannot, by merely dissecting any bodily organ whatever discover its vital functions. As Gall has said, anatomists for many centuries dissected the nerves of motion and sensation, and saw nothing in their structure that indicated the difference of their functions; and, at this moment, if the nerves of taste and hearing were presented on the table, we might look at them for ages without discovering traces of separate functions in their structure.

If the cortex of the brain served really for sensation and movement only, animals and savages with greater muscular power and more perfect senses than civilised man should have the most highly developed brains.

Other distinguished physicians, preferring clinical observation to animal experiment, have covered almost the whole surface of the brain with areas for the various elements composing speech, including reading and writing centres, leaving little space for other mental functions; again quite forgetful of the fact that animals, though they are devoid of articulate speech, possess the identical parts of the brain.

A full history of brain research will be found in my big work: "In Search of the Soul." (See p. 15).

Ferrus, Foissac, Fossati, Foville, Le Gallois, Rostan, St. Hilaire, Sanson, Sarlandière, and Voisin.

In 1809 Gall had commenced publishing his great work, entitled *Anatomie et Physiologie du Système Nerveux en général et du Cerveau en particulier*, in four folio volumes, with an Atlas of 100 plates. The work was finished in 1819. The price was 1,000 francs per copy, so that only libraries could afford to buy it. This is one of the reasons why it remained unread and unknown. Gall died on August 22nd, 1828.

Gall had dissected the brains of insane persons and found that "the change in the brain is not always perceptible, the derangement may be purely functional." He advocated an enlightened treatment of the insane. His doctrine supplied asylum physicians with a practical application of the mental functions in place of the visionary theories which had been hitherto maintained.

He also dissected the brains of the mentally deficient and found that "imbecility is not always the result of a defective brain organisation; the functions of the cerebrum may be impeded by other causes."

He was the first to point out that moral defects are frequently caused by affections of the brain, and gave an enlightened account of moral responsibility. He is the pioneer of modern criminology. He regarded all men as potential law-breakers, and advocated that "prisons must become houses of correction."

His pupil and protector, John Caspar Spurzheim (1766—1832), constructed a philosophical and physiognomical system on Gall's localisations with some additions of his own, and gave it the name of "phrenology," when he took up his home in England in 1814*.

On his visit to Edinburgh, he converted the brothers George and Andrew Combe. George Combe became subsequently the foremost advocate of phrenology and wrote numerous works on it, including *The Constitution of Man*, which was described by Horace Mann, the American educationalist, as "the greatest book that has been written for centuries," and it is said that it was almost as popular as the Bible in those days. Dr. Andrew Combe was one of the first to advocate the humane treatment of the insane and the abolition of restraint before Dr. Conolly put it into practice.

The Combes made many converts. All over England and Scotland phrenological societies were formed, of which the most important was the Edinburgh Phrenological Society, founded in 1820. Its Transactions were published in the *Edinburgh Phrenological Journal* (1823—1847). Many of the discussions recorded therein, as I have already mentioned, are identical with those contained in modern psychological journals. Eminent physicians and other distinguished men were attracted to phrenology, which gave them a practical philosophy of life, and an insight into Human Nature. Among those who actively supported phrenology there were: W. A. F. Browne, John Cheyne, Sir James Clark, John Conolly, Sir Astley Cooper, Sir James Cox, Robert Dunn,

* The doctrine soon became popular, but its spread was not due so much to Spurzheim as to the famous Dr. Abernethy, who confessed to his "inability to offer any rational objection to the new doctrine as affording a satisfactory explanation of the motives of human conduct," and had invited Spurzheim to give a series of demonstrations on the brain to his pupils at St. Bartholomew's Hospital. After that a phrenological bust was a regular outfit of every surgery and found a big sale among the general public. The misfortune was that people came to think that the markings on the bust represented the whole of Gall's doctrine.

John Elliotson, Sir William G. Ellis, James Esdaile, Sir William Fergusson, Sir John Fife, Sir John Forbes, Littleton Forbes Winslow, W. A. Guy, Sir Henry Halford, John Haslam, Sir Henry Holland, Robert Hunter, James Johnson, Thomas Laycock, Sir John Macintosh, Robert Macnish, Sir Henry Marsh, Thomas Mayo, Sir T. C. Morgan, Daniel Noble, James Scott, Samuel Solly, William Stokes, E. S. Symes, Robert Todd, and William Weir.

The popularity of phrenology received a severe blow in 1842, not from extraneous sources, but from within. While George Combe was a deeply religious man, a section of phrenologists expounded extreme materialistic views, which acted like an explosive and broke up the phrenological societies, never to be survived again. Thus Elliotson and Engledue affirmed that phrenologists were in error in propounding that the brain was the organ of the mind, inasmuch as there was no such thing as mind. We only knew the brain, and the brain was simply a viscus with its own proper functions like the liver and kidneys. What they meant was probably no more than conveyed by the recent utterances of Sir Arthur Keith that "mind is merely the manifestation of a living brain." But it was said eighty years too soon.

The unbiassed reader must acknowledge that Gall deserves to rank amongst the world's pioneers in science and philosophy. Yet he has been treated shamefully for a whole century. Even within recent years, before the Henderson Trust organised the lectures by Prof. G. Elliot Smith, Sir James Crichton-Browne and Sir Arthur Keith, men of the highest repute but ignorant of Gall's works, have referred to him as a "fraud," "charlatan," and in similar terms of opprobrium. They described his doctrines as "devoid of all scientific foundation," and "dead and buried long ago," and one of our leading medical journals declared them as "unworthy to be countenanced by a scientific profession." These sweeping generalisations and condemnations are all the more to be deplored since they were uttered by eminent authorities, to whom the world looks for facts and guidance, and were repeated year after year to medical students. They did immeasurable harm and hindered the advancement of science*.

* Sir Charles Bell (Phil. Transactions of the Royal Society, 1823) declared Gall did not know the difference between cerebrum and cerebellum.

Andreas Retzius (1796—1860), a famous anthropologist and craniologist, wrote that "Gall knew nothing of the convolutions of the brain."

Jos. Hyrtl (1811—1894), the well-known Viennese anatomist, said that science ignored Gall's doctrines completely, just as it had to ignore other erroneous theories which are advanced from time to time and "do not deserve the honour of being refuted."

K. Rieger, in his *Schädellehre* (1882) declared Gall "a swindler," and said "For genuine scientists, Gall's errors were so crude, that they could be treated only with pitiful contempt."

W. Crochley Clapham (*Journal of Mental Science*, 1898), said: "It would be 'flogging a dead horse' at the present day to offer arguments against the exploded phrenology of Gall, which has long been discredited by scientific men."

Sir Thomas Spencer Wells (1818—1897) wrote of Gall's doctrine: "This bubble has been so often and so demonstratively exploded, that we scarcely think men of science are bound any more to trouble their heads about it."

Dr. Charlton Bastian (1837—1915) claimed to have examined Gall's doctrine and to have found it "fallacious in almost every respect." Amongst other errors Gall considered "the grey matter of the convolutions—the matter which we now believe to be so

Had Gall discovered only a new foramen in the skull, or a new fissure in the brain, every medical student would know his name and revere him; but because he revolutionised the whole of the structure and functions of the nervous system by his numerous discoveries, he was not understood, and in the end was disregarded†.

Considering that we are still ignorant of the *mental* functions of the brain, and that brain research has been almost at a stand-still since the discoveries of the motor and sensory centres in the brain, it seems to me that the time has come for renewed investigation by methods more likely to lead to practical results. Without accepting Gall's conclusions, we might commence, as he has done, with the most primitive animal brain and study its reactions, and work up to the most complex cerebral structure and mental organisation of man—and verify our results by clinical observations. The subject is of such profound and far-reaching importance that its investigation should no longer be delayed.

That is one method and the approved method. But there is another which might be used for confirmation at least, one to which scientists would not hitherto condescend, though they did not hesitate to criticise its results. And that is—again on Gall's lines—to observe the size and shape of the head in men distinguished for certain abilities and characteristics: for instance, a comparison between the head of a great musical composer and that of a tone-deaf person; the head of a man gifted with mathematical or linguistic ability or any other special talent and one in whom it is absent; the head of a man known for a special characteristic as for temper, love, greed, and compare it with one of an opposite disposition. These observations need not necessarily lead to the same results as Gall had arrived at; but to refuse to make them is sheer folly.

largely concerned with the most delicate and subtle of brain functions—to have no proper nerve function at all." (!)

According to Frederick Peterson, Chief of the Nervous Clinic of New York (*American Medico-Surgical Journal*, 1905), Gall's doctrine was "founded upon the observation of busts and pictures, no anatomical investigations were made," and his ardour "was greatly stimulated by the pecuniary reward to which it almost immediately led."

† Some day I may publish my own personal experiences. In this essay I must confine myself to giving a list of the books in which I have given records of Gall's life and works and furnished evidence of the truth of his doctrine. As long ago as 1886 I published a Lecture delivered before the Aristotelean Society on *The Positive Philosophy of the Mind* (L. N. Fowler). In 1889 I addressed the Anthropological Institute on *Centres of Ideation in the Brain*, when Ferrier, Horsley, and other brain experts were present and took part in the discussion. In the same year I gave a Lecture before the British Association for the Advancement of Science at Newcastle, when Sir William Turner, F.R.S., was in the chair. In the following year I again addressed the British Association at Leeds on the same subject. In 1900 I published *Die Psychischen Thätigkeiten des Gehirns* in Berlin (Hirschwald). My defence of Gall caused a sensation amongst German experts and made Möbius, a distinguished specialist at Leipsic, take up the subject and write a number of books on it with considerable success. In 1901 I brought out my work on *The Mental Functions of the Brain* (Grant Richards), the main facts of which have been put on permanent record by Prof. Alexander MacAlister in the *Encyclopædia Britannica* (10th and 11th Edition). In 1902 I published *Scientific Phrenology* (Grant Richards); in 1910 *The Mental Symptoms of Brain Disease* (Rebman); and in 1920 my *magnum opus* on Brain Functions and on the life and work of Gall, entitled: *In Search of the Soul and the Mechanism of Thought, Emotion and Conduct*. (Kegan Paul).

At present we have not even a theory which would enable us to diagnose the locality affected in mental disorders arising from definite lesions, except that of Gall. Often the scar of a former injury may be discovered. I have published a large number of cases in which subsequent surgical operation led to the recovery of the patients.

What are the signs that distinguish a good head from a bad one, a mentally deficient from a normal one? Text-books ignore these important questions. Why should it be inconsistent with the dignity of the medical profession to look at the head of a backward boy, whether his condition is due to innate or acquired defect? Or of a normal boy, whether he has definite talents in certain directions?

Daniel Hack Tuke (1827—1895), the well-known alienist, wrote: "The diversity, as regards the form and size of the human cranium, can only have escaped the notice of the least observant, or failed to excite some interest in the least reflective. This diversity is observable, not only in regard to the whole head, but also its several regions. The head of one is large and massive, of another small and ill-developed; but more than this, the forehead of one may be broad and ample, while that of another is shallow and retreating; the facts are notorious. On the other hand, the mental characteristics of one individual do not contrast less strongly with those of another. Between the two extremes of the highest psychical endowment and the helpless condition of idiocy, every conceivable shade of intellectual character or function is to be met with."

There could be no better memorial in honour of the hundredth anniversary of Gall than to repeat his investigations. But we must first of all clear our minds from preconceived notions which frequently are based not on personally examined evidence, but on the faith of authorities of long ago who did not know better, considering the state of science at the time.

Such investigations would be in harmony with Gall's own wish, as may be seen from the following reflections with which he concluded his folio work on the *Anatomy and Physiology of the Brain*:

"Here terminates this big work, which for fifteen years the public has been impatiently expecting. I should have wished to defer it still longer to bring the fruits of my researches to greater maturity; but the final hour draws near, and I must be content with leaving this first effort on the physiology of the brain far less perfect than it will be fifty years hence. Neither the life nor the fortune of one man can be sufficient for this vast investigation. I have had to depend on my own resources. It will require many fortunes to bring this study to perfection, which my unaided efforts could not alone effect. If I had been a man to be gratified with a little temporary éclat, I should have yielded more than twenty years ago to the desire of publishing the first views of a physiology of the brain; but I am prouder of the discovery of the slightest truth than of the invention of the most brilliant system. If anyone will convince me of the falsity of my discoveries, I shall be the first to announce it to the public. Truth is my object. I place it above all personal considerations. May all my adversaries follow my example."

